Monitoring and Evaluation Report
Grand Valley Unit
Colorado River Salinity Control Project
2005

USDA-NRCS
GRAND JUNCTION

EXECUTIVE SUMMARY
GRAND VALLEY
2005

HYDROSALINITY -

- The project plan is to treat approx. 60,000 acres with improved irrigation systems.
- To date 34,078 acres have been treated with improved irrigation systems.
- The project plan is to reduce salt loading to the Colorado River system by 132,000 tons of salt.
- In FY 2005, salt loading has been reduced by 2,776 tons of salt per year as a result of installed salinity reduction practices.
- The cumulative salt reduction applied is 95,446 tons/year, or 72.3 percent of the goal.

COST-EFFECTIVENESS -

- The planned cost per ton of salt saved with FY 2005 contracts (one year) is $75.96/Ton. This figure is calculated as follows:

(FA + TA = Total Cost) X Amortization factor = Amortized cost

Amortized cost / Tons salt reduced = Cost/Ton

FA = Total dollars obligated in EQIP and Parallel Program (including wildlife)

Amortization for 2005 = 0.07364

TA = technical assistance cost: (FA x 0.67)

OTHER PROGRAM BENEFITS -

- There has been a positive effect to local landowners as a result of salinity practice implementation. The main benefit continues to be labor savings associated with on-farm and off-farm irrigation improvements.
- Irrigation improvements, both on- and off-farm, are seen as valuable improvements in city and county planning departments, and irrigation improvements are codified in development regulations.

EXECUTIVE SUMMARY
GRAND VALLEY
2005

- The program is receiving support from newer ad-hoc governmental and private organizations such as the Grand Valley Selenium Taskforce, and the newly formed Wise Water use Council.
- Landowners irrigating with water from the Grand Valley Water Users' Association have benefited from lower water use, and therefore, lower water costs, as this system charges for water on a volume basis. Water use has been documented in landowner case files.
- Fertilizer use and efficiency contributes to increased yields and lower production costs.

OTHER RELATED ITEMS -

- There is a funded education program as it pertains to work performed one-on-one with individual landowners. Each landowner receives follow up education and demonstration pertaining to Irrigation water management.
- The number of applications is constant in areas of vineyard and orchard crops.
- The number of applications and the individual size of applications in all other areas of the Grand valley are declining.

EXECUTIVE SUMMARY- WILDLIFE
GRAND VALLEY
2005

Habitat Acres (both upland and wetland) includes 38.2 acres applied with USDA programs other than salinity.

Cumulative Acres Applied 2004	**Cumulative Acres Applied 2005**	**Acres Left to Apply (800 Goaled)**
281.89	38.33	479.78

Wetland Data from 1991-2005

Cumulative acres impacted year 1991-2004	Cumulative acres impacted year 2005	Net AREM Unit change 1991-2004	Net AREM Unit change 1991-2005	Net change
+37.99	+12.2	+20.9	+24.08	+3.18

Funding for Wildlife Habitat (All Programs including WHIP)

% of total obligated funds that are obligated to wildlife through 2005	% of total obligated funds spent on wildlife through 2005
6.64%	2.04%

Funding for Wildlife Habitat 1996-2002

% of total funds spent on wildlife through 1996-2002	% of total funds spent on wildlife through 2005
1%	4%

The Natural Resources Conservation Service (NRCS) has been placing improved irrigation methodology with selected cost-sharing to cooperators since 1979 through the Colorado River Salinity Control Program. The Colorado NRCS in the Grand Salinity Control Program Unit completed irrigation monitoring on a variety of improved irrigation systems for the crops commonly grown to determine the effectiveness of the salinity control programs in meeting planned goals. A variety of irrigation systems were evaluated including earthen ditches with earth feeder ditches, earthen ditches with siphon tubes, concrete ditches with siphon tubes, ported concrete ditches, pipeline to gated pipe, side roll sprinklers, and micro spray. Crops included alfalfa, corn, small grain, dry beans, orchards, grapes, onions, pasture, and vegetables. This monitoring took place throughout the entire Salinity program period from 1979 to 2003. Data are compiled for 213 site years of measured irrigation inflows, outflows, crop consumptive use, precipitation, and deep percolation. The data indicate that the salinity projects in Grand Valley are typically achieving a deep percolation reduction of at least 10 to 15 inches for each acre treated, which meets or exceeds the 8 inches of deep percolation reduction estimated in the original project reports. Areas with a greater conversion to sprinkler or micro spray will be at the 15 inch reduction and areas with predominantly flood irrigation will be at the 10 inch reduction. Areas that are converting unimproved flood systems will have deep percolation reductions in the 27 to 32 inch range. Areas that are converting very old systems with limited improvements, will most likely be somewhere between the higher values and the lower values, but probably closer to the 10 to 15 inch reduction than the 27 to 32 inch reduction.

Beginning in 2004, NRCS, in cooperation with the Mesa Conservation District and the Colorado State Conservation Board began a program designed to place emphasis on Irrigation Water Management. IWM activities were quite abbreviated in 2005 when compared to 2004 since the position was reduced to a half-time position.

The remaining time for the position was utilized to advise and contribute to the agricultural land to urban land conversion irrigation project.

The irrigation season was marked by more seasonable weather than in the previous

three years which were characterized by heat and drought. There were no water shortages or limitations set forth in Mesa County, and irrigation proceeded normally. Irrigation in the Mesa County area is characterized by mostly gravity-fed systems installed on heavy, clayey soils derived from a marine shale formation (Mancos shale) that is very saline. The intake rates of the soils are generally low to medium.

By virtue of plentiful and inexpensive irrigation water coupled with the heavy clay soils, long irrigation set times and excessive flow rates are the norm. This leads to deep percolation losses of water and low efficiencies of application. The excess deep percolation water contacts the underlying Mancos shale and subsequently loads salt to the Colorado River. We have considered deep percolation to be the primary indicator of the effectiveness of the irrigation application; others may be concerned with the efficiencies of the irrigation. Since the deep percolation losses of water are the main contributor of salt loading to the river system, that figure holds our greatest interest. Previous studies have shown that surface water runoff (tail water) does not change appreciably with respect to salinity in the water as it travels from the head of the field to the bottom of the field, but does increase dramatically with respect to sediment load, particularly after a tillage procedure during the first several irrigations on a row crop field. Sediment increases in alfalfa and pasture (grass) irrigated fields are minimal as well as salinity increases. In fact, we have observed a "cleansing" of the irrigation water as it traverses these fields of alfalfa and pasture.

Methods

A list of NRCS cost-share contract holders was given to the IWM specialist. At the beginning of the irrigation season, it was suggested that each IWM specialist contact between 30 and 40 landowners to assist them in their irrigation practices. In addition to contacts made from the list, a notice was published in the FSA newsletter to make the program known to landowners. Contacts were made as a result of this notice.

Once contacts were made and appointments scheduled, field visits were completed and a series of questions were submitted to the landowner for the purpose of clarifying the IWM process. Suggestions were made at this time to the landowner to assist him in

making his irrigations a bit more efficient.

Many producers continued to call this office regarding questions concerning irrigation, and many involved a field visit. Every field visit resulted in the producer being given a ball probe and an irrigation guide booklet. Instructions on the use of the ball probe and pertinent facts within the booklet were provided to them.

Results

Over one hundred telephone queries were fielded during the course of 2005. These resulted in 33 field visits to examine the situations first-hand. The following acreages and types of systems were involved:

Type of system	Acreage
Surge	42
Concrete ditch, siphon tubes	66
Gated pipe	271
Micro spray	22
Sprinkler	5

Various crops were being produced on these acreages. The following numbers reflect the acreage of the crops:

Crop	Acreage
Alfalfa	141
Small grains	118
Orchard	27
Corn	120

Several producers had just acquired properties with an existing irrigated system and were not familiar with irrigation in general. Efforts for these producers consisted of demonstrating the basics of irrigation systems and how to achieve efficient irrigations. These producers commented on the increased crop yield achieved as a result of the assistance, while actually reducing the labor necessary for irrigation due to proper

timing and scheduling of irrigation events. Two additional field technicians were trained in the basics of irrigation water management. These technicians, both of whom work for the Mesa Conservation District, will perform field visits to assist landowners in irrigation water management activities in 2006.

Many of the field visits were to small acreage owners who had just moved here from non-irrigated areas. Their idea of irrigation was to run the water on to the field as slowly as possible to “soak up” the field in their words. We have noticed this mindset of irrigation procedures many times before. The proper use of irrigation water was demonstrated; that is, get the water through the field rapidly and then cut the flow back to the desired level.

The need for irrigation water management for producers continues to be an important concept, especially in view of the rapidly changing land use and ownership of land in the area. The efforts of IWM will be reflected in reduced deep percolation losses of irrigation water and improved irrigation efficiencies.

Other Activities:

This office received 41 telephone calls regarding irrigation. Most of these problems were solved over the phone during the course of the conversation, but some required field visits. Often, the producers did not have an EQIP or Basin Parallel Program contract but simply needed assistance with their irrigation. Many of these calls were from homeowners. Other calls were received dealing with salinity and soil fertility.

Educational Activities

Material on soil salinity was presented to the Cooperative Extension Master Gardner Class.

A Salinity demonstration was conducted for Colorado Foundation for Water Education.

An article was published in a Farm Service Agency newsletter that went to every Mesa County landowner soliciting the assistance available for IWM.

We made contact with the Grand River Mosquito Control District and gave them some irrigation guide booklets and a few ball probes with written instructions on their use to

pass out to various producers in the valley who had standing irrigation water on their property. The Mosquito Control District has become a strong ally in the pursuit of proper irrigation water management. The field personnel from the district contacted us if the producers desired to participate in irrigation water management. Several did, and we were instrumental in assisting them in reducing the standing water (mosquito habitat) and improving the efficiency of their irrigations.

Urban Use of Irrigation Water

Although not a part of the EQIP program and the monitoring requirements of the position, we have been concerned about the abuse of irrigation water by suburban and urban users, both newcomers to the area as well as experienced homeowners. An informal measurement of lawn watering by homeowners confirmed this suspicion in the 2003 irrigation season. In late 2004, the Mesa Conservation District received a grant to study the effects of ex-urban and suburban development on irrigation water use and deep percolation. Below is a summary of the accomplishments of the first year of the Grand Valley Urban Water Study and Deep Percolation Project. The project goal is to characterize the deep percolation from urban irrigation, and compare it to historic levels of deep percolation from agricultural irrigation.

Homeowners

1. Located, contacted, qualified, and trained homeowners for participation in study
2. Developed log forms for homeowner recordkeeping
3. Designed and constructed 11 water pressure data recorder systems
4. Monitored irrigation at 13 home sites – 6 large sites (5 acres) and 7 regular sites (1/4 acre sites)
5. Monitored irrigation at 2 native planted (xeriscape) sites
6. Collected soil moisture data from all sites at 3 different times during season
7. Calculated deep percolation using ET data, precipitation data, homeowner logs, pressure logs, and runoff data for all sites

Parks

1. Monitored irrigation at two park sites – Canyon View Park and Chipeta Commons

2. Collected soil moisture data from both sites at 3 different times during season
3. Calculated deep percolation using ET data, precipitation data, park logs, and runoff data for both sites

Ponds

1. Measured seepage at 2 ponds (Paradise Hills & Chipeta Pines)
2. Surveyed 1 pond (Paradise Hills) and calculated area/capacity curve
3. Collected pan evaporation data for both sites

Total Subdivision Inflow

1. Collected inflow data at 2 subdivisions – Paradise Hills and Chipeta Pines
2. Calculated irrigated turf acres at both subdivision (Terry Franklin)

ET Method Research

1. Contacted many experts on ET, including the principal designers of the NRCS ET method to understand the NRCS study methods for ET
2. Performed statistical comparison study between current ET and historic ET methods to insure compatibility between two data sets

Historic NRCS Data

1. Researched availability of NRCS data
2. Transferred NRCS report data from 1984 thru 2003 from paper to spreadsheet
3. Performed preliminary analysis of NRCS deep percolation data

Irrigation Audits

1. Performed irrigation audits at 13 homeowner sites

Presentations

1. Presented data to Mesa Conservation District Board in December
2. Presented cyber seminar for NRCS, CWCB, and CRWCD principals in January.

Preliminary results and discussion

Reportable results will not be released until the completion of the 2006 study year; however, preliminary data show a wide range of deep percolation on small acreage and urban lot-size units, similar to the variability found in traditional farmland. It is thought that overall water use would be reduced due to an increase of impervious areas such as

streets, curbs and gutters, and rooftops in these urbanizing areas. Indeed, the Grand Valley Irrigation Company, which is impacted to a large extent by urbanization on their system, has documented this to be true. However, on individual systems, there is the same range of proper water use to misuse that exists elsewhere.

Recommendations for Future Monitoring and Discussion

- Monitoring in the salinity control areas has been accomplished and further monitoring would only be redundant. Efforts therefore will proceed toward irrigation water management with selected irrigators.
- For 2006, effort will be directed to all new EQIP and BPP contract recipients to address irrigation water management and proper use of newly installed irrigation systems.
- For 2006, data will continue to be collected and compiled from urban and small acreage sites. The effects of conversion to urban and small acreage land units must be evaluated to assess the effects of the changes on the projected salinity reduction. Many of the areas treated under the program are being converted to smaller 1 to 2 acre parcels. The Grand Valley areas near Grand Junction, Fruita, and Loma are transitioning to these smaller parcels. There appears to be increasing support and transition to smaller parcels in the Grand Valley, in spite of the general community desire for larger lots that create the appearance of more open space, etc. They continue to be irrigated, but by a new landowner and with different crops, usually hay or pasture and lawn and garden.

- Many of the larger parcels are being subdivided in the 20 acre to 40 plus acre size and remain in some type of crop production, but under a new owner/manager that works a primary job off the farm and may have no previous experience with irrigation.
- Significant problems still exist in the delivery of water in unimproved and outdated

laterals and other group delivery systems. There is a need for these groups to incorporate and improve these systems; however it is increasingly difficult for this to occur. Most laterals have doubled or even tripled the number of users on the laterals due to subdivision, and this influx of inexperience has driven more complaints and operation problems. The EQIP program is poorly suited to planning and providing cost share for improving these systems, as participants must be agricultural producers. The cost of improving these systems exceeds the cost-effectiveness limits for the BPP and EQIP programs, currently set at $60/Ton for BPP and $90/ton for EQIP.

- Many irrigation systems improved in the early years of the salinity programs are nearing the end of their practice life. This will need to be addressed as some of these systems will eventually need to be replaced. Some systems are capable of lasting far longer than the stated practice life, e.g. underground pipeline, while other systems have definitely deteriorated.
- The participation level of the program and the treated area completed to date show significant success for both the popularity and the past participation of the program. There is still much interest for improvements in parts of the Grand Valley dominated by vineyards and fruit crops. For more traditional crops, the treated acreage level is resulting in fewer applications, as the majority of large acreages have been treated. Many applications are received for irrigation improvements for parcels as small as one acre. These shifts in demographics must be addressed.

- There are opportunities to assist the new and inexperienced land owners with effective irrigation water management and systems operation. The projected salinity reduction for these types of units should be evaluated so appropriate adjustments to cumulative salinity loading information can be made based on measured values.

- Knowing that many of the land units may be facing future land use changes due to development requires adjustments to irrigation system designs to provide a salinity reduction benefit with the current operation. Designs must take into account further and future development, which drives up the current construction costs.
- Cost effectiveness of the Grand Valley program is being affected by the above construction cost increases and by the reduction of the sizes of parcels made available for the cost share programs.

WILDLIFE

History and background:

The Grand Valley project area is located in west central Colorado adjacent to the Colorado- Utah border and includes the entire irrigated area of the Grand Valley North of the Colorado River and the area served by the Orchard Mesa Irrigation District on

Orchard Mesa. The Grand Valley is characteristic of the arid, cold desert ecosystem common to western Colorado and eastern Utah. Historically, the Grand Valley was dominated by desert vegetation communities, with narrow wetlands and riparian zones along the Colorado and Gunnison rivers and several natural washes. The present mosaic of cover types (agricultural, Riparian, wetland, and desert shrub) are a direct result of current irrigation systems and practices. With the advent of irrigation and the associated waste water, return flow and seepage, the natural vegetation changed from sparse, saltbush desert communities to crops or “natural” cover types such as wetland /riparian, willow/cottonwood, tamarisk, saltbush and greasewood. Cover types other than cropland are restricted to areas unsuitable for agriculture, such as canal and lateral banks, fence rows, washes, irrigation return flows and drains, roadsides, and other low-lying areas.

The agricultural areas are composed of orchards, pastures, and crops such as alfalfa, corn and small grains, that are entirely dependent upon irrigation for production. The area originally comprised about 66,000 acres of agricultural land used for agricultural production; however development over the last 25 years has reduced the actual amount of land available for cultivation to approximately 58,000 acres. The Grand Valley landscape is for the most part characterized by small (1 to 20 acre) parcels of irrigated land subdivided from traditionally larger units. As one progresses West and North of Fruita and Loma, larger irrigated fields still remain, and traditional farming and agriculture continues. The impact of development is increasing in these areas.

The Fruita, Loma and Mack communities are expanding outward from the original boundaries, and are now experiencing more development pressure than any other area of Mesa County.

Impacts to wildlife and habitat in the Grand Valley were addressed originally with the Grand Valley Environmental Assessment, prepared jointly by the US Bureau of Reclamation, USDA, and the US Fish and Wildlife Service. The Environmental Assessment determined that 4000 acres of wildlife habitat would be lost due to the

activities and construction of improvement of on- and off-farm irrigation systems in the Grand Valley. Based upon analysis of the potential impacts, the assessment and subsequent agreements by the agencies required replacement of the 4000 acres of wildlife habitat. Seventy percent of the replacement requirement was assigned to the US Bureau of Reclamation, and thirty percent or 1200 acres was assigned to the USDA, representing on-farm impacts. In the Grand Valley, wildlife habitat is replaced on an "acre for acre" basis.

In 1991, the Grand Valley unit began tracking wetland type and value changes based upon the Avian Richness and Evaluation Methods for wetlands of the Colorado Plateau (AREM). Wetlands impacted by planned conservation practices were evaluated using this method and Circular 39 from USDI to establish an existing habitat value. The impacted wetlands were re-evaluated using the above criteria to determine existing wetland habitat value. In 1993, The Bureau of Reclamation purchased nearly 400 acres of property for development of wildlife habitat to augment the On-farm (USDA) goal of 1200 acres.

Current methods

Wildlife habitat replacement progress is tracked by acres. Additionally, wetland habitat value changes are assessed using AREM. In an inter-agency meeting on December 10, 2004 it was agreed that only habitat development currently on the ground will be credited for habitat replacement. 1200 acres of habitat credited to NRCS will need to be on the ground when the project is finished.

At project end, past NRCS habitat development that no longer exists (due to a variety of reasons) will not be credited to NRCS. This process of reporting and field verification of program results and records will continue for the remainder of the program. The type of wildlife improvement practices has remained consistent over the years of the salinity program. Practices include ponds, establishment of permanent vegetation on upland and wetland sites, and tree and shrub planting. Pond construction includes membrane lining at all locations except where the pond is at equilibrium with existing water table.

Pond location and construction is reviewed by the Fish and Wildlife Service for depletion impacts, and impacts to endangered fish species. Signs include current applicable provisions and guidelines for their mitigation. Fencing is used for livestock exclusion.

Results

Results and progress from wildlife improvement in detail are listed in an EXCEL spreadsheet. These data represent the final audit and update for all wildlife progress in the Grand Valley to date, and are verified form field visits performed by a wildlife biologist. The data reflect upland and wetland habitat acres and wetland values, both planned and applied. Salinity and wildlife habitat improvements have been cost-shared by several different programs over the last 25 years; therefore progress is also presented by program.

Programs for salinity control include:

Grand Valley Salinity Control Program (GVSP)	1987 - 1995
Interim Environmental Quality Incentive Program (IEQIP)	1996
Environmental Quality Incentive Program (EQIP)	1997 -2005
Colo. River Salinity Control Program (CRSC)	1978 -1989
Colo. River Basin Parallel Program (BPP)	1998 – 2005

- Note that there is some overlap in programs.

Beginning in 2004, additional funding was made available through the Basin States Parallel Program (BSPP) for wildlife projects that would contribute to the mitigation efforts in the Grand Valley and other salinity control units. To date this additional funding has resulted in 4 projects planned that will enhance approximately 75 acres.

Summary of Wildlife Habitat Applied:

Acres applied in all salinity programs 1978-2004	281.89 acres

Reported and Applied 2005	38.33
TOTAL	320.22 acres
Remaining Acres needed to meet mitigation goal	479.78

Acres applied with Wildlife Habitat Incentives Program for all years: 38.2 acres

Wetland Data from 1991-2005

Cumulative acres impacted year 1991-2004	Cumulative acres impacted year 2005	Net AREM Unit change 1991-2004	Net AREM Unit change 1991-2005	Net change
+37.99	+12.2	+20.9	+24.08	+3.18

Funding for Wildlife Habitat (All Programs including WHIP)

% of total obligated funds that are obligated to wildlife through 2005	% of total obligated funds spent on wildlife through 2005
6.64%	2.04%

Discussion of Results

A total of 1599.15 acres of wildlife habitat have been planned through 2004, with an additional 38.2 acres planned for 2005, for a cumulative total of 1637.35 acres. Approximately 20 percent of projects planned were applied and still remain. Cost share programs are being managed to reduce cancellation of wildlife practices, such as requirements that wildlife habitat be installed under separate contracts. Also, practice lifespan for practices associated with wildlife habitat are longer, now 20 to 25 years, so retention rates should increase. GVSP program practice life was set at ten years. Progress reported tends to be in increments of tenths of acres up to two or three acres. The sizes of most program participant's properties are small. It is difficult to locate areas on these smaller parcels that can be sheltered and otherwise protected from roadways and headquarters.

Conclusion

Effort must be placed upon increasing the interest among landowners to establish and maintain wildlife habitat. Development impacts are impacting the salinity control program in general and are impacting the planning and application of wildlife as well.

Many landowners and participants are moving from the city to newly created small parcels. The Grand Valley area is beginning to see a shift in how these landowners view and manage these parcels. Landowners purchase these parcels for open space, views, more space and privacy and rural quality of life. They typically consider the parcels as “extra-large lots, rather than farms or agricultural pursuits. Many of these landowners are still interested in improving their land and irrigation but do not do so for productivity or other traditional agricultural reasons. The Programs and Assistance must adjust to this segment of landowners. It is possible to capitalize on this shift by demonstrating the benefits of improving small open space parcels for wildlife habitat. Other opportunities should be pursued in the Grand Valley, as follows:

- Working closely with conservation easement holders to develop wildlife Habitat
- Working with entities, Mesa County and the cities of Fruita, Grand Junction, and Palisade in corridor and buffer zones to promote easements with a wildlife emphasis
- Locating larger remaining parcels of land and initiating direct contacts
- Locating areas and land parcels along existing drainage corridors such as washes that could be developed